Worsening of Acne Scars from Trichloroacetic Acid CROSS Delivered via Micropipette: A Case Report

by JESSE J. VEENSTRA, MD, PhD; JOSEPH W. FAKHOURY, BS; and DAVID OZOG, MD
Drs. Veenstra and Ozog are with the Department of Dermatology, Henry Ford Health System in Detroit, Michigan. Mr. Fakhoury is with Wayne State University School of Medicine in Detroit, Michigan.

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ABSTRACT

Application of trichloroacetic acid (TCA) via the "Chemical Reconstruction of Skin Scars" (CROSS) method is a well-established treatment for acne scars. Generally, an applicator, such as a needle, is repeatedly moved between the TCA container and the patient, potentially resulting in accidental spills. To mitigate this risk, we investigated a repeating electronic micropipette with self-contained fluid reservoir as a novel TCA applicator. A 46-year-old African American male patient with long-standing ice pick and boxcar acne scars on the face initially underwent six 100% TCA CROSS treatments using a 30-gauge needle, which resulted in significant improvement in scarring. Immediately after 100% TCA CROSS treatment using a repeating electronic micropipette, the patient experienced increased pain and hyperpigmentation. Two months later, the patient had more prominent scars with persistent erythema and increased atrophy. An additional treatment with 100% TCA CROSS using a 30-gauge needle led to subsequent improvement. TCA CROSS delivered via a repeating electronic micropipette may result in less precise application of TCA relative to a 30-gauge needle, with subsequent necrosis of adjacent healthy tissue and worsening of acne scars. Miniscule volumes of concentrated TCA should be applied with a precision applicator, such as a 30-gauge needle, to prevent TCA spread to adjacent healthy skin.

KEY WORDS: Acne, scarring, chemical reconstruction of skin scars, CROSS, trichloroacetic acid

Scarring is a well-known complication of acne that can significantly impair quality of life.[1] Numerous treatment modalities for acne scarring have been proposed, but the application of trichloroacetic acid (TCA) has consistently been shown to be an effective and safe treatment.[1–3] Cutaneous application of TCA acts to cause protein precipitation and coagulative necrosis of the epidermis as well as papillary and upper reticular dermal collagen necrosis, yet spares adnexal structures.[2] Reepithelization occurs from adnexal structures, with subsequent dermal collagen remodeling and regeneration.[1,2] Localized application of concentrated TCA within atrophic scars, referred to as the "chemical reconstruction of skin scars" (CROSS) method, has been shown to produce favorable results.[2,3] Using this approach, an applicator, such as a toothpick or a needle, is used to apply a small amount of highly concentrated TCA to atrophic scars, resulting in numerous frosted white areas within each scar.[2]

Although TCA CROSS can effectively treat acne scars, the necessity of an open container of highly concentrated TCA for application purposes is potentially hazardous for both the patient and user. When applying TCA, the applicator is required to repeatedly move between the container of TCA and the area being treated, sometimes more than 100 times. This process is not only tedious, but also creates a scenario where there is an increased likelihood of an accidental spill. To help eliminate this potential hazard and streamline the application of TCA, we used a repeating electronic micropipette with self-contained fluid reservoir as a novel TCA applicator. Unfortunately, this technique of TCA CROSS led to worsening of acne scarring in our patient.

CASE PRESENTATION

A 46-year-old African-American male patient with long-standing ice pick and boxcar acne scars on the face initially underwent six treatments of TCA CROSS with 100% TCA applied with a 30-gauge needle, resulting in significant improvement in the appearance of scarring (Figure 1A). Dipping a needle into TCA with this method creates a fine film of TCA on the needle, which allows for precise transfer of a small amount to the treatment area. During the seventh treatment, an Ovation (VistaLab, Brewster, New York) repeating electronic micropipette with a fine, 20-µL tip was used to deliver 0.5µL of 100% TCA to individual acne scars with the patient's consent (unlabeled use). Following this treatment, the patient noted a painful response with increased hyperpigmentation compared to after previous treatments (Figure 1B). When the patient returned to the clinic two months later, the treated scars had become more prominent, with persistent erythema and increased atrophy (Figure 1C). The patient was subsequently retreated with 100% TCA CROSS using a 30-gauge needle as previously done, which led to improvement once again.

DISCUSSION

It is important to report and publish adverse

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CORRESPONDENCE: Jesse J. Veenstra, MD, PhD; Email: jjveenst1@gmail.com

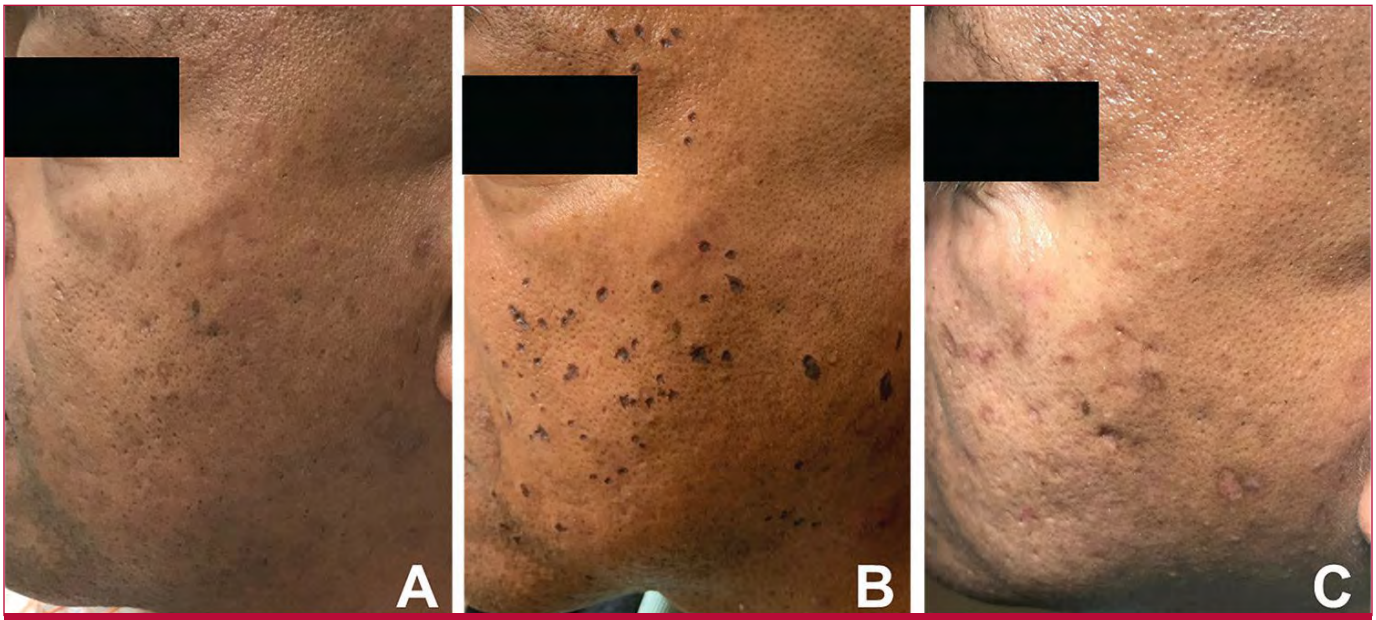

FIGURE 1. A) Icepick and boxcar acne scars in a 46-year-old African American patient after six treatments of chemical reconstruction of skin scars with 100% trichloroacetic acid (TCA) using a 30-guage needle; B) Day 1 after application of 100% TCA using a micropipette with 0.5-µL volumes; C) Day 56 after 100% TCA application using a micropipette; the previously treated acne scars showed increased atrophy with persistent erythema.

events such as these, particularly when adopting novel treatments. Although TCA has generally been shown to be safe and effective in the treatment of acne scarring, several reports have described adverse effects using the CROSS method.[4–7] A study assessing 70% TCA CROSS applied to acne scars with a toothpick at two-week intervals for a total of four treatments found that, of the 62 patients treated, nine (17%) exhibited coalescence of neighboring scars and subsequent formation of larger scars.[4] A separate report also described increased atrophy of several treated acne scars in a 28-year-old woman after two treatments of 80% TCA CROSS one month apart using a sharpened applicator.[5] A study in 30 patients with atrophic acne scars who were treated with 50% TCA CROSS in three sessions at one-month intervals described adverse events in four patients: two patients had prolonged posttreatment erythema (four weeks) and two experienced posttreatment hyperpigmentation.[6] The erythema resolved after treatment with topical steroids, and the hyperpigmentation responded well to six weeks of daily 4% hydroquinone.[6] Finally, in a report of 12 patients with atrophic ice pick acne scars treated with 100% TCA CROSS applied every two weeks in four sessions total, one patient experienced transient hypopigmentation and another experienced transient hyperpigmentation.[7]

Our patient most likely had worsening of his scars due to the less precise application of TCA using the micropipette relative to a 30-gauge needle, which led to necrosis of adjacent healthy skin. Preliminary testing of this technique using a volume of 0.5µL, which was the lowest reproducible volume deliverable, of both water and 100% TCA allowed for placement of very fine uniform microdroplets on a frosted glass slide. However, while these microdroplets could be easily reproduced on skin using water in the testing phase, we noted that 100% TCA was more prone to undesirable spread from the applied sites in our patient (Figure 1B). This difference in microdroplet formation and fluid migration between TCA and water was most likely due to the difference in surface tension between the two fluids. Unfortunately, this affected the precision of TCA application, which likely resulted in the worsening of scar appearance.

CONCLUSION

This case illustrates an adverse effect of 100% TCA CROSS with a repeating electronic micropipette despite using a fine pipette tip with a volume of 0.5µL. While TCA CROSS is generally well tolerated, clinicians must be aware of potential adverse effects so that they can effectively mitigate and manage them. We recommend using a sharp applicator, such as a 30-gauge needle, to apply minuscule volumes of concentrated TCA to acne scars precisely and avoid TCA spread to adjacent healthy skin. Any techniques that apply larger volumes have the potential to lead to imprecise application and scar worsening.

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